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Generalized Modeling for Alaskan Crab Stocks

Crab Modeling Workshop January 2014

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Acknowledgements

Gmacs is a collaborative project between the University of Washington, and NOAA Fisheries; Collaborators: Andre Punt, Jim Ianelli, and with advice from Mark Maunder (CAPAM) and Steve Martell (IPHC)

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Gmacs: Generalized Modeling for Alaskan Crab Stocks

admb
FAST, ACCURATE, STABLE OPTIMIZATION

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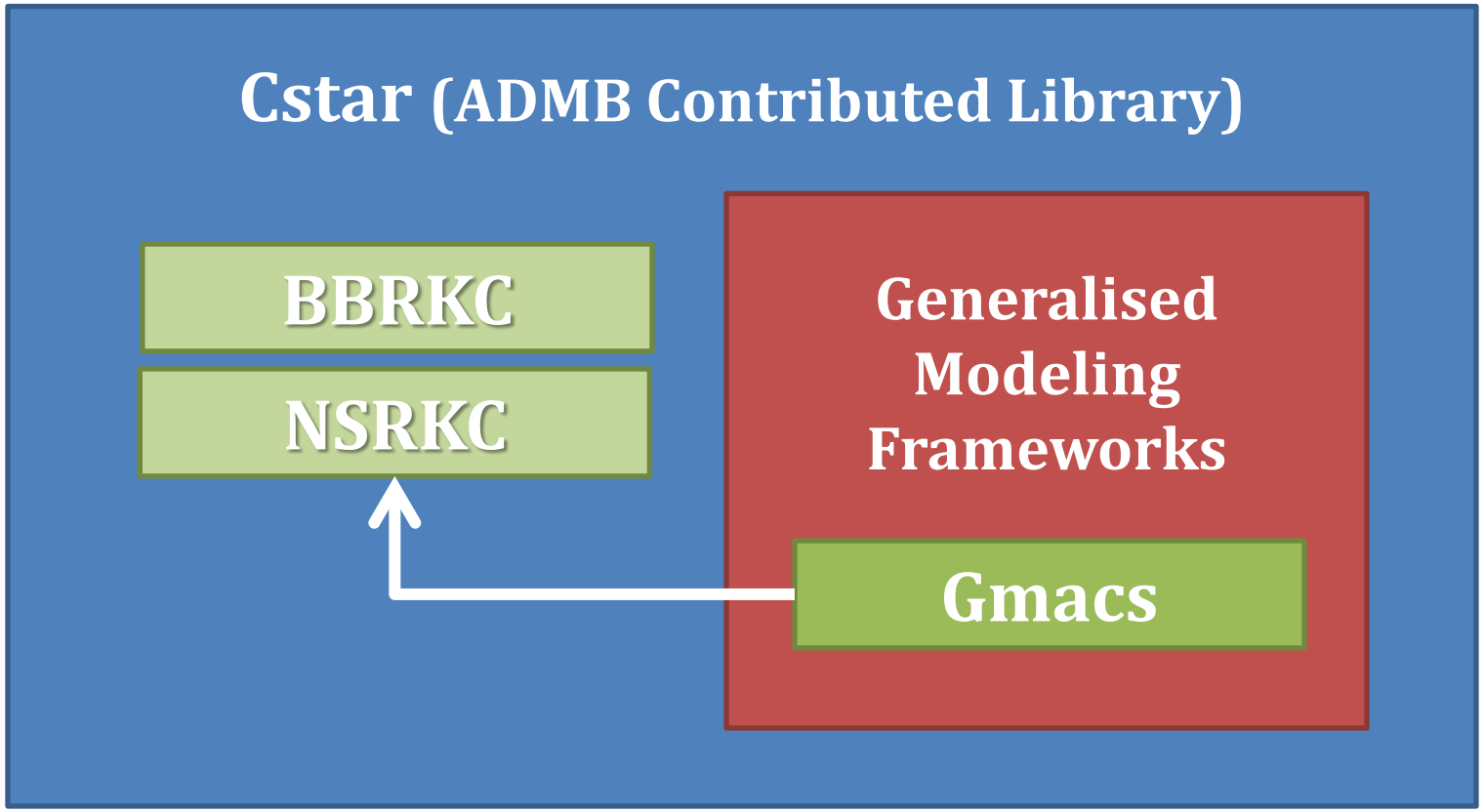
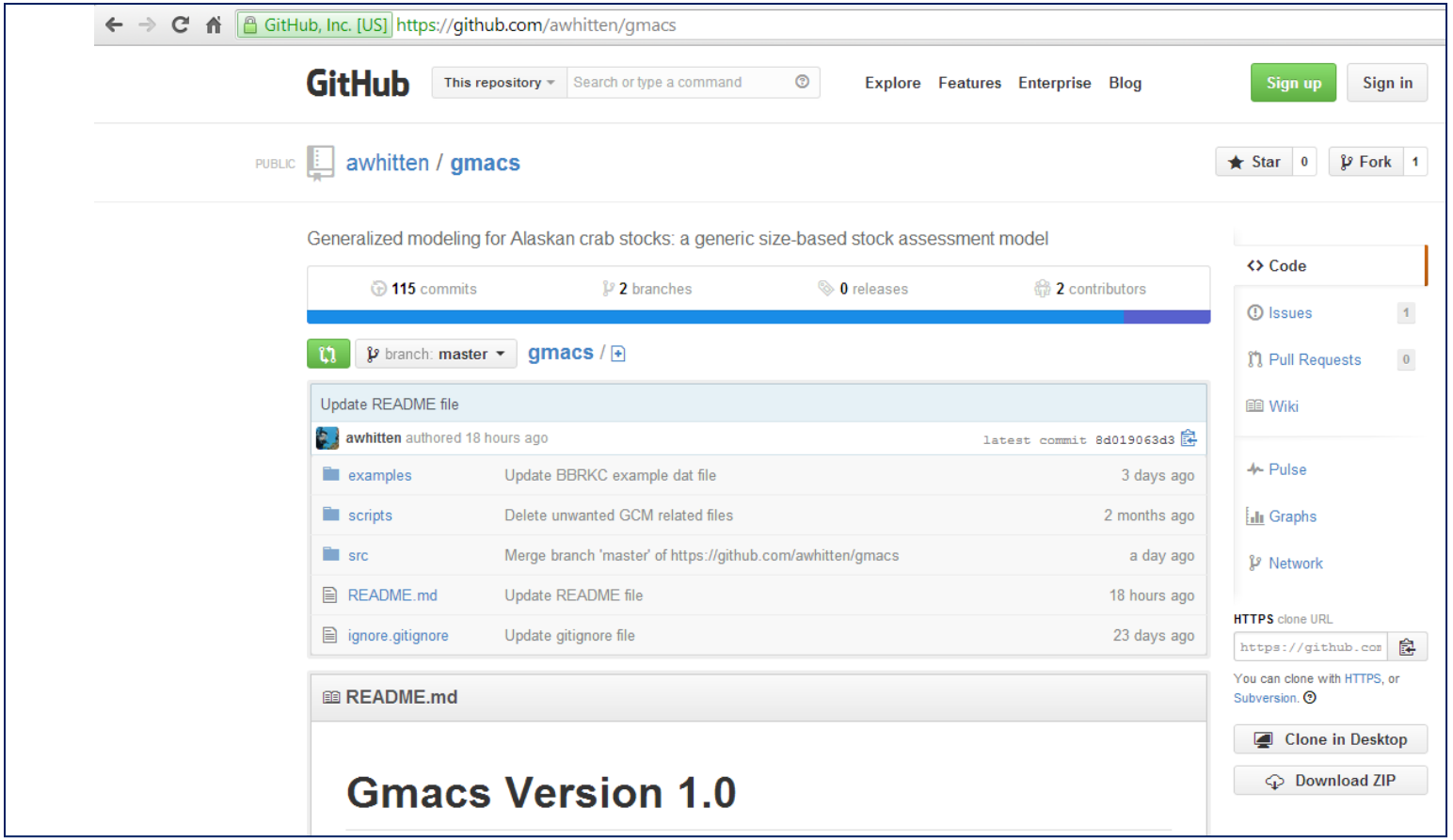
Gmacs will be implemented using Cstar



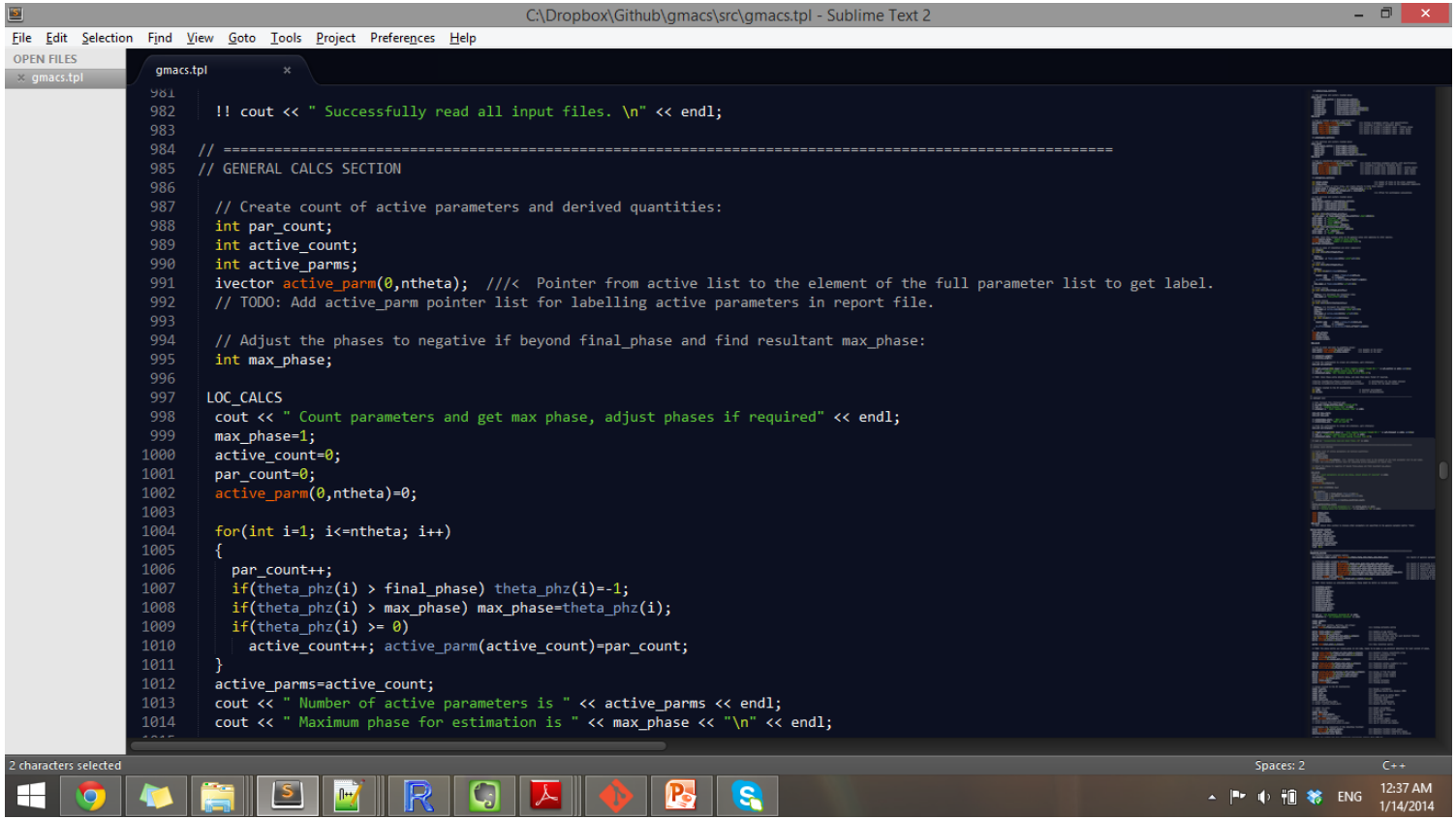
See: https://github.com/awhitten/gmacs

Using Github to store, share, and collaborate



Collaboration possible onsite or by using Git:
Can download entire repositories to local machines

Code is publically available



And has been written with flexibility and usability in mind…

General Population Dynamics

- Size-structured, fully integrated assessment
- Numbers at time and length
- Also accounts for numbers at sex, maturity, and shell condition. Crab can be:
    - Male, female, unknown
    - New shell / old shell (1,2,…) / unknown
    - Mature / immature / unknown
- Natural Mortality can be time-varying and sex-specific

General Population Dynamics

- Size-structured, fully integrated assessment
- Growth can be fixed or estimated
    - Gamma distributed growth increments
    - Can be sex specific and time-varying
- Molting probability as logistic function of length
- Maturation as logistic function of length
- Stock recruitment estimated as yearly-deviations

Fishery Specifications

- Landings recorded from directed fisheries
- Discards from landed *and other fisheries* (bycatch)
- Fishing mortality estimated or directly specified
    - Handling mortality included in calculations
    - High-grading included in calculations
- Retention specified as piecewise or logistic function
- Selectivity can be defined for any fleet or survey
    - Can be sex-specific and time-varying

Data Types & Model Fit

- **Model makes use of:**
  - **Catch and discard data**
  - **Fishery or survey indices of abundance**
  - **Effort data**
  - **Length composition data**
  - **Weight-at-length, and fecundity specified**
  - *Later: Tag-recapture data*
- **Model fits to catch, discard, indices, and LF data**
- **Different weights can be applied to each data set**
- **Weights on priors, and penalties can be specified**

Model Outputs

- **Size of the reproductive component of population**
    - **Reported in terms of mature male biomass**
    - **Specified for particular fraction of year**
- **Fits to catch, survey, and length frequency data**
- **Estimates of selectivity etc.**
- ***Later:*** *Projected stock abundance (forecast section)*

Thanks for listening…

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